







### 3.7 Factoring Using Algebra Tiles

#### Representing algebraic expressions with algebra tiles

 represents 1	 represents $x$	 represents $x^2$
 represents -1	 represents $-x$	 represents $-x^2$

#### Multiplying binomials using algebra tiles (EXPANDING)

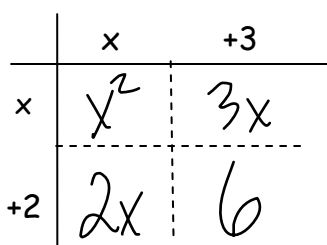
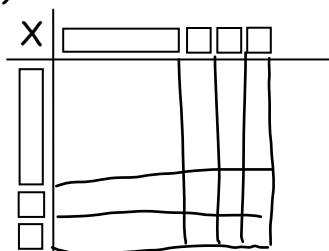
- 1) Multiply the following binomials using *algebra tiles*, the diagram et then algebraically

Algebra tiles

Diagram

Algebraically

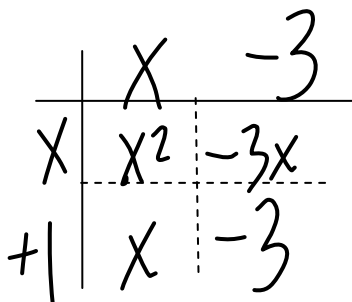
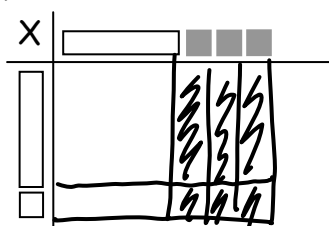
a)



$$= x^2 + 2x + 3x + 6$$

$$= x^2 + 5x + 6$$

b)

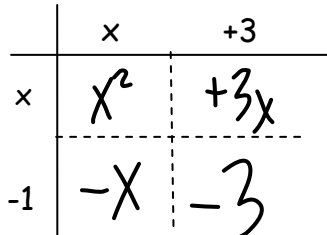
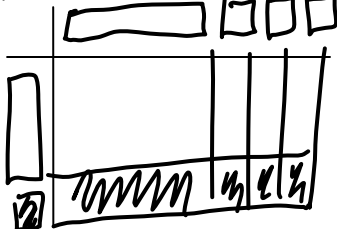


$$= (x-3)(x+1)$$

$$= x^2 + x - 3x - 3$$

$$= x^2 - 2x - 3$$

c)



$$= (x+3)(x-1)$$

$$= x^2 - x + 3x - 3$$

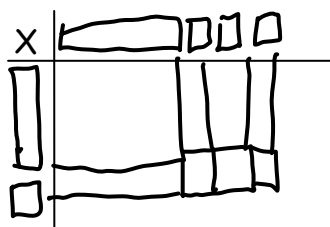
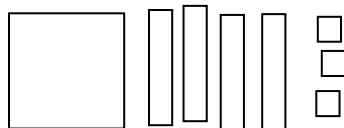
$$= x^2 + 2x - 3$$

**Factoring or creating rectangles**

Rules: The large squares ( $x^2$ ) cannot touch the small squares (1)  
 The tiles in each *quadrant* must all be the same colour

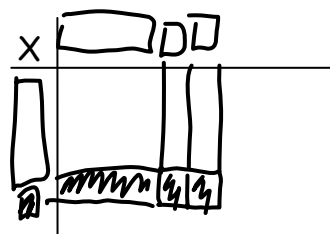
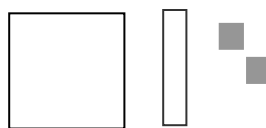
2) Create a rectangle using the following *algebra tiles*

a)



$$x^2 + 4x + 3 = (x+1)(x+3)$$

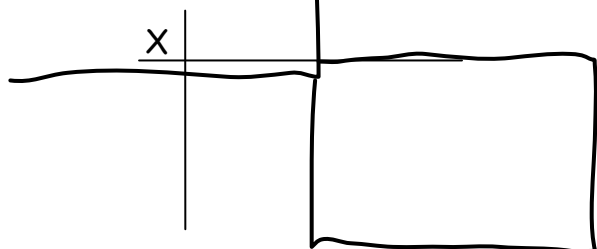
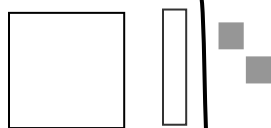
b)



$$x^2 + x - 2 = (x+2)(x-1)$$

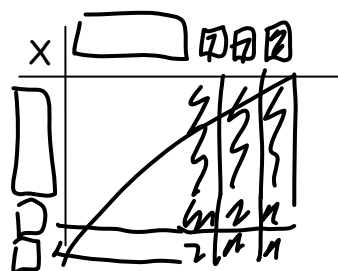
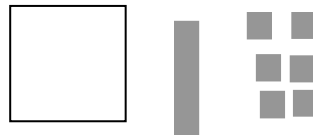
3) Create a rectangle using the following *algebra tiles*

a)



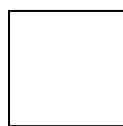
$$\underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

b)



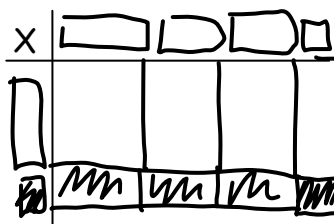
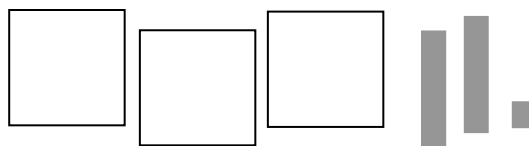
$$x^2 - x - 6 = (x-3)(x+2)$$

c)



Handwritten algebraic work for factoring  $x^2 + 9x + 2$ . The student has written  $(x-3)(x+2)$  and drawn a grid with tiles. The grid shows  $x^2$  (white square),  $9x$  (grey squares), and  $2$  (white squares). The student has crossed out the  $2$  and written  $-9$  and  $2$  next to it, indicating a correction or a different approach.

d)



$$3x^2 - 2x - 1 = (3x+1)(x-1)$$

### Factoring Simple Trinomials Algebraically when $a = 1$

Consider:  $(x + 2)(x + 3) = x^2 + 5x + 6$

What relationship is there between the factors and the coefficients of the answer?

**Think of it this way...** What is the relationship between  $c$  and  $b$  in standard form  $y = ax^2 + bx + c$ .

Ex.1 Factor

(a)  $x^2 + 4x + 3$

Handwritten work for factoring  $x^2 + 4x + 3$ . The student has written  $3 \times 1 = 3$  and  $3 + 1 = +4$ . Arrows point from these results to the factors  $(x+3)$  and  $(x+1)$ .

(b)  $x^2 - 8x + 12$

Handwritten work for factoring  $x^2 - 8x + 12$ . The student has written  $-6 \times -2 = 12$  and  $-6 + -2 = -8$ . Arrows point from these results to the factors  $(x-6)$  and  $(x-2)$ .

4) Factor the following expressions and verify your answer by multiplying the binomials.

a)  $x^2 + 3x + 2$

$$= (x+1)(x+2)$$

b)  $x^2 + 4x - 12$

$$= (x+6)(x-2)$$

c)  $x^2 + 4x + 3$

$$= (x+1)(x+3)$$

d)  $x^2 - 3x - 10$

$$= (x-5)(x+2)$$

e)  $x^2 + 7x + 12$

$$= (x+3)(x+4)$$

f)  $x^2 - 7x - 8$

$$= (x-8)(x+1)$$

g)  $x^2 + 8x + 16$

$$= (x+4)(x+4) \\ = (x+4)^2$$

h)  $x^2 - 4x + 4$

$$= (x-2)(x-2) \\ = (x-2)^2$$

i)  $x^2 - 7x + 12$

$$= (x-3)(x-4)$$

j)  $x^2 - 16$

$$= (x-4)(x+4)$$

k)  $4x^2 - 25$

$$= (2x-5)(2x+5)$$

l)  $49x^2 - 81$

$$= (7x-9)(7x+9)$$

m)  $2x^2 + 3x + 1$

$$= (2x+1)(x+1)$$

n)  $6x^2 - 5x - 4$

$$= (3x-4)(2x+1)$$

o)  $6x^2 + 7x + 2$

p)  $3x^2 + 7x + 2$

q)  $2x^2 + 3x - 14$

r)  $2x^2 + 7x + 6$